THE RELATIONSHIP BETWEEN THE ENACTIVE AND SYMBOLIC LEVELS OF SERIATION AND CLASSIFICATION

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Research linking different operational levels of reasoning is scarce and contradictory in the literature. Some studies reveal hierarchical construction in the development of reasoning (Cohen et al., 2002), but others question this finding (Caroff, 2002). Understanding the nature of changes through the levels of abstraction would be especially important for understanding the development of reasoning and for finding methods to foster it. In the present study the relationships between levels of abstraction are investigated through the example of two reasoning skills, Piagetian seriation and classification (cf. Desoete et al., 2009). Following a strand of research, these will be referred to together as systematizing skill (cf. Nagy, 1990). The aim is to answer the question whether enactive systematizing ability is a predictor of the development of the symbolic level. The first data collection of a longitudinal study took place in fall 2013, when students in the sample started the first grade. The post-test was administered in fall 2015, when they were in grade 3. Data from both assessments are available from 197 students (107 boys and 90 girls). At the time of the pre-test, students' mean age was 7.08 years (sd=0.40 years). A criterion-referenced, diagnostic test was used to assess first graders. It is administered individually and targets the enactive level (26 items, Cronbach's α=.87; m=78%p, sd=17%p). Tasks required the selection, grouping and ordering of colored plastic shapes. In addition, information from the RAVEN intelligence test and from a background questionnaire on students' socioeconomic background was available. In grade 3, a test targeting the symbolic level of systematizing ability was administered (38 items, Cronbach's α=.80, m=58%p, sd=15%p). Tasks were isomorphic with those of the enactive test, but they now used symbolic content. To answer the research question, the method of structural equation modeling (SEM) was used. Fit parameters (χ^2=34.28, df=22, p=.04; RMSEA=.053; CFI=.959; TLI=.933; SRMR=.049) justify the hypothesized relationships. SEM results show significant effects of intelligence and enactive systematizing on the development of symbolic systematizing ability. Variables included in the model explain 45% of the variance. Enactive systematizing is significantly influenced by intelligence and parental education (26% of the explained variance). This study has shown that the developmental level of enactive systematizing has an important role in the development of the symbolic level. However, the findings also suggest that in fostering the symbolic level, both enactive and symbolic developmental programs are necessary.

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